Synergizing fertilizer micro-dosing and indigenous vegetable production to enhance food and economic security of West African farmers (CIFSRF Phase 2)

Project Number 107983

Location of Study: Nigeria and Benin Republic

Efficiency of Scaling Up Approaches

MICROVEG PROJECT

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Key messages:

- We present a detailed and comprehensive comparison of the efficiency of the two scaling up models (Section 5.0 Pages 20) of this report.

- The scaling up objective of the MicroVeg project was achieved through the professional and technical support of the five NGOs (The Green Generation, The IAR&T, Alpha Omega Environnement AOE, Association pour la Recherche et la Promotion en Pisciculture Intégrée AR2PI and ZACOZA-ONG) that were recruited since the inception of the project. The NGOs played significant role in active development of the outreach, awareness creation, organization of meetings, extension and negotiations. These key activities that were shouldered by the NGOs ensured the success of the scaling up of vegetable technologies to reach and exceed the targets.

- Our project reached a total of 337,931farmers (50.6% female) in 36 months. The total number of farmers (vegetable producers) reached in Nigeria is 229,750 (51.6% female) while in Benin, 108,181 farmers (46.3% female) were reached through both scaling up models, SDA and IP. This shows that the project has effectively reached target number of 255,000 farmers planned for the project period.

- By this final reporting period, the project had reached 124 schools, trained 881 teachers (46% female) and 82,713 students (51% female) in Nigeria, while in Benin 57 schools had been reached and training of 76 teachers (38% female) and 30 157 students (41% female) on fertilizer microdosing and value addition.

- The total revenue generated by the YVSC in Benin and Nigeria were USD 2 197 and USD 2 428, respectively. The project distributed 6,625kg of *Ugu* seed (*Telfaria occidentalis*), 1085kg of *Igbagba* seed (*Solanum macrocarpon*), 2200kg of *tete* seed (*Amaranthus*). We also donated a total of 200 knapsack sprayers, 120 irrigation pumps, 120 irrigation hoses(50 m each), 10 fuel generators, 5 deep wells, 250 watering cans. Hoes and cutlasses, 75 Microveg planters, 500 bags of urea fertilizers and 1000 sachets of seed dressing treatment to farmers as incentive.

- Land devoted to fertilizer microdosing in IP districts was three times more than that of the SDA and women taking the lead (69%) over the men in Nigeria and 46% female lead in Benin. Total land area devoted to fertilizer microdosing in Benin is 280 ha while in Nigeria, it is 356 ha

- Male constitute a total of 952 (59%) of the total actors in the innovation platform and they dominate the transportation business (almost 100%) and 82% dominance of government agencies while the female gender is clearly dominant (81%) in vegetables marketing.

- At the IP level in the vegetable value chain, fewer male gender (25-30%) had problems with transportation, marketing, access to land, access to loan, control of pests and diseases and access to fertilizer and inputs compared to 70-75% in the female gender.

- In Benin and Nigeria, the Innovation Platforms reached more farmers than Satellite Dissemination Approach. The number of farmers reached by IP in Benin increased from 855 (12 months) to 9,353 (36 months) whereas SDA increased from 200 (12months) to 1,766 (36months) per district. In total for IP and SDA enabled to reach 10,005 farmers (12 months) to 108,181 farmers (36 months).In Nigeria, the number of farmers reached by IP increased from 33,600 (12

months) to 226,500 (36 months) whereas the SDA increased from 1498 (12months) to 65,615 (36months). SDA reached almost one fifth of the performance of the IP in Benin while in Nigeria, SDA reached more than one sixth of the performance of IP. The average women share was 51.3% for Nigeria and 46% for Benin.

- As at March 2018, a total number of 337,931farmers was reached by the two scaling up approaches in the two countries with 51.1% female.

- In Nigeria, as at March, 2018 majority of the actors at IPs were vegetables producers (229,750) (51.5% female) while in Benin, producers are 108,181 (46.3% female). Vegetable marketers (21,528) (71.2% female) in Nigeria while in Benin, vegetable marketers (6,948) (72.2% female). Vegetable processors were 561 in Nigeria and 12,562 Benin with 62.5% and 98% female, respectively while extension service officials were 945 in Nigeria and 65 in Benin with 52.4% and 21.5% females respectively. Seed suppliers were 478 (48.1% female) in Benin while in Nigeria, seed suppliers were 140 (32.1% female). Least actor was recorded with the transporters with 1.3% female in Nigeria and 0% female in Benin.

- As a result of our scaling up activities, both at SDA and IP levels, within three years of MicroVeg project intervention, average land area under vegetable production in Benin increased from 985 ha to 2,575 ha in the period of 12 to 36 months representing 161% increase. Also, average land area under vegetable production in Nigeria increased from 9,105ha to 79,110 ha within the same period representing 768% increase.

- The average land area per farmer increased from 0.02ha to 0.07ha in Nigeria and from 0.03 to 0.06 ha in Benin, within the period of Microveg intervention. Women adopted more (three times) microdosing technology than men in all districts under IP.

- The average land devoted to microdosing on IVs in IP districts was three to four times that of SDA. The average land area under microdosing technology increased from 11ha/district (18 months) to 280ha/district (36months) in IP compared to 4 – 33.26 ha/district in SDA in Benin. In Nigeria however, average land under micro-dosing increased from 23ha/district to 120 ha/district under the IP compared to 9-30ha/district under SDA.

- Involvement of many actors along the vegetables value chain, through the Innovation Platform (IP) enables MicroVeg to understand issues of concerns in the entire value chain. The issues of concern include lack of facility for dry season farming, lack of high quality seeds, poor access to land, lack of organized transportation, pests and diseases problems, poor fertilizer supply. In response to those constraints, MicroVeg project provided the necessary intervention to address the concerns of the different actors. A comparative analysis (2015 vs 2018) of the level of concerns between male and female farmers showed that with MicroVeg's IP intervention, the gap between men and women farmers is closing up. This is because women now have equal access to and control over resources.

- To ensure continuity of availability of quality seed to meet the needs of the IV producers we carried out extensive training of the existing and intending seed producers.

- In Nigeria, to ensure unhindered credit sourcing for vegetables value chain actors, our project initiated and signed MoU with LAPO Microfinance Bank (MfB). MicroVeg negotiated the interest rate on the loans and the repayment period with the LAPO MfB. Loans are to be repaid between 6-12months at an interest rates of 3.6% monthly (other bank loans in Nigeria attract at least 19% interest rate) with repayment to commence at the end of 60 days after release of funds and an incentive of a 40% draw back on interest for farmers who complete loan repayment by the end of the loan duration.

- Nigeria MicroVeg facilitated the negotiations with LAPO MfB with farmers in attendance and today we are pleased to report that as at March, 2018, LAPO MfB has provided a total loan of NGN13 million (US$37,142=CAD47,514) for vegetable production to our farmers.

- After careful considerations of the IP and SDA success factors, IP was adjudged to be the most vibrant and useful tool to disseminate and scale up technologies among smallholder farmers.

- We integrated 181 secondary schools 124 in Nigeria and 57 in Benin) into MicroVeg Project Young Vegetable Scientist Club (YVSC) and we trained them in vegetable production technologies. We also trained 957 teachers made up of 881 teachers (46% female) in Nigeria and 76 teachers (38% female) in Benin. We are glad to report that there was no YVSC in the schools at the take-off of our project but we established these clubs and we reached 82,713 students (51% female) in Nigeria and 30157students (41% female) in Benin.

Executive Summary

1.1. Project Overview

The Microveg project is a three-year (2015-2018) project planned to conduct action research on "Synergizing fertilizer micro-dose and indigenous vegetables innovations to enhance food and economic security of farmers in the West African sub-region". Field research and development actions are being implemented in Nigeria and Benin Republic. The research team focused on scaling up advancements in indigenous vegetables production to increase traditional vegetable yields while also preserving soil and water ecosystems, and conserving fertilizer costs. The project also placed special emphasis on resource-poor women farmers in the development and implementation of the research project. The project aimed at promoting policy advocacy by integrating the successful indigenous vegetables production and value addition innovations into local, national and regional food security programmes in West Africa.

2.0. Introduction to Scaling up models

Scaling up the MicroVeg Project technologies is the main focus for CIFSRF 2 and has been the driver of all the project activities since the inception in March 2015. The major success factors of the NiCanVeg and INuWaM which resulted into the Scaling up Phase - MicroVeg include the simplicity, profitability and farmers-friendliness of the agronomic and value addition technology capsules. Therefore, our focus

was to support further dissemination of the technologies to a significant number of farmers (51,000 direct beneficiaries in 51 districts in Nigeria and Benin by March 2018) to ensure the adoption of technologies leading to economically viable, healthy and nutritious indigenous vegetables value chain. There are 3 major technologies that the project scaled up: agronomic technology package, seed production technology and value addition technology.

Our three basic technology capsules are:

1. Agronomic technology package which include: ***optimum seeding rate and seeding method for the three selected vegetables, optimum staking option for ugu, breaking of seed dormancy in igbagba, continuous harvesting schedule for ugu and igbagba, botanical pest control; dry season-irrigated production and water management, and integrated soil nutrient (fertilizer micro-dose) management***).

2. Value addition technology package which include: ***drying technologies for vegetables(local and industrial techniques), vegetables handling and storage, local extraction techniques of nutritious vegetable content, production of vegetable bread, cookies, syrup and incorporation of vegetables into daily meals***

3. Seed production technology package which include***: Seed production and handling, seed quality control, seed storage and seed packaging***,

The target is to reach 51,000 direct beneficiaries by using 2 scaling up approaches. The two approaches are: Innovation Platform (IP) approach and the Satellite Dissemination Approach (SDA). The Innovation Platform approach, a new multi-stakeholder scaling up strategy is based on availability of proven methodologies/technologies which are ready for dissemination to various actors. This was adopted as the major research scaling up approach, while the SDA was the control research scaling up approach as it is a proven methodology already adopted by major extension programs across Africa.

The SDA which is being used to scale up the technologies in 6 districts in Nigeria and Benin follows the usual linear extension model where the research team disseminates a set of innovation through the extension system. Among all the tools in SDA which had been tested earlier are: group training in technology extension, Participatory Research and Development such as Farmers Field Schools (FFS), demonstration trials and community-based outreach through farmer collective action. Demonstration trials and exchange visits among actors were used extensively as major tools for effective dissemination during scaling up implementation.

The IP approach involves working with multiple parties/actors for consensus-building and is being used to scale up to 45 districts in Nigeria and Benin. The core role of IPs is to improve coordination and collaboration along the value chain, which is expected to result in more efficient and equitable linkages that benefit those poor who are economically active. The IP stands as the most promising and most recent scaling up approach (Tenywa *et al*. 2011; Sones and Duncan, 2011; Gillespie, 2004) and is based on the assumption that improved interactions help to forge linkages between stakeholders which will results in enhanced communication and information exchange, and ways to address common challenges.

In summary, the hypothesis behind the **Innovation platfom Approach** is that cooperation among stakeholders and actors enhances adoption and scaling up while **Satelite Disemination Approch** relies on information and capacity building (training, demonstration, information) to reach the same goal.

Therefore, the objectives of the scaling up MicroVeg technologies are to:

- Present the achievement and how indigenous vegetables technologies are scaled up through IP and SDA in Nigeria and Benin
- Analyze the impact of factors such as agro- ecological environment, social environment (gender, importance of NGOs actors, development project, Farmer organization, local policy makers, etc ;), market (well organized market, poorly organized market, no market) on the performance of IP and SDA.
- Analyze the impact of scale up of traditional leaves vegetables innovations through IP and SDA on individuals, groups and territories.

2.1 Why scale up MicroVeg Technologies?

In scaling up MicroVeg technologies, we focus on improvements in peoples' lives through:

- Enhanced production of indigenous vegetables to generate more income for farmers and other actors to live better life, resulting in poverty reduction, especially among women.
- Increased access to food and protein sources and generally diversified vegetable-fortified nutritious diet.
- Improvement in women's access to and control over productive and farming resources, and
- Building capacity of a pool of young champions in vegetables production enterprise through the Young Vegetables Scientists Club (YVSC).

The major drivers of MicroVeg indigenous vegetables project are the simplicity, affordability, profitability and farmers-friendliness of our agronomic and water management technologies, seed production and value addition technology. Therefore, MicroVeg Project, after fine-tuning these technologies, is now extending same to reach larger and significant number of actors including farmers, marketers, processors, consumers, input sellers and policy in Nigeria and Benin Republic.

Research question

This scaling up proposed project seeks to address the following research question:

- To what extent can communication strategy and cooperative society approach ensure successful scale up?

3.0. Implementation of the Scaling up Strategy

3.1 The Scaling up models in brief

In reaching out, MicroVeg is using two major scaling up models: the **Satellite Dissemination Approach (SDA)** and the **Innovation Platform (IP)**. Our major objective is to examine which of the two delivers most effective performance in scaling up innovations and technology. In summary, the hypothesis behind the **Innovation Platform Approach** is that cooperation among stakeholders and actors enhance adoption and scaling up while **Satellite Dissemination Approach** relies on information and capacity building (training, demonstration, information) etc to reach the same goal.

Briefly, the SDA has the following activities:

- It is a linear extension model where the research team disseminates a set of innovation through the extension system.
- Among the tools in SDA are the group training in technology extension, participatory research and development such as Farmers Field Schools (FFS), demonstration trials and community-based outreach through farmer collective action.
- Demonstration trials and exchange visits among actors were used extensively as major tools for effective dissemination during scaling up implementation.

Briefly, the IP approach has the following activities:

- It involves working with multiple actors for consensus building.
- The core role of IPs is to improve coordination and collaboration along the value chain, which is expected to result in more efficient and equitable linkages.

The IP is based on the thesis that improved interactions, through dialogue along the value chain could help to forge linkages among stakeholders which could result in enhanced communication and information exchange to address common challenges.

The scaling up phase of the project had two components: a research component and a development component.

The cascades of flow of dissemination for the two models are presented in Appendices 1 and 2. The commodity value-chain platform was established in 51 districts where Indigenous Vegetables are grown.

3.2. Setting up IPs

The approach brought together key stakeholders in the Indigenous vegetable value chain to address productivity, access to inputs (seed, fertilizer), nutrition, market, natural resource management, policy and their interface issues. The approach was implemented in forty-one districts of seven states in Nigeria (Oyo, Osun, Ogun, Ondo, Ekiti, Kwara and Lagos states) and eleven (11) districts in Benin Republic (N'dali, Bembereke, Djougou, Natitingou, Boukombé, Parakou, Tchaourou, Bohicon, Abomey-Calavi, Cotonou, Grand-Popo) . The 3rd party partners with the support of the MicroVeg team has been able to set up 147 IP cells in all 7 states in Nigeria and 11 districts in Benin republic. These cells are close knit platforms that represent the interest of local players within the vegetable value chain in each given community.

For our scaling up we adopted 3 levels of IPs for MicroVeg technologies:

- Cell IPs- there are platforms that were set up at community level
- District/Operational IPs – these are platforms set up at Local Government levels
- Strategic IPs- These are platforms established at the State level

3.2.1 The steps we used to establish IPs include:

- Identification of vegetable farmers and farming communities
- Identification of the other actors/stakeholders involved in vegetable value chain for IP (seed producers and sellers, farm input suppliers, financial institutions, transporters, vegetables marketers, government ministries, processors and industries, etc).
- Series of visits to the farming communities and markets to create awareness of the project and request for their cooperation
- Training of project technical and field staff on scaling up activities and necessary operations
- Series of meetings on benefits of IP and signing of agreements with the IP groups.
- Launching of the Innovation Platform at selected locations

- Setting up of Innovation Platform (Establishment of location of IP activities in cells, clusters and allocation of responsibilities) and Functioning of IPs (Making IPs function effectively)

3.3 Setting up SDA

The Satellite Dissemination Approach (SDA) was used to scale up the technologies in 6 districts in Nigeria -Ipetumodu, Akanran, Ogbomosho, Ilesa, Odogbolu and Ile-Ife and three districts in Benin (Tchaourou, Ouake and Djidja). It followed the usual linear extension model where the research team disseminates a set of innovation through the extension system which include: group training in technology extension, Participatory Research and Development such as Farmers Field Schools (FFS), demonstration trials and community-based outreach through farmer collective action. Demonstration trials and exchange visits among actors were used extensively as major tools for effective dissemination during scaling up implementation.

Steps taken to establish SDA in MicroVeg:

- Establishment of base stations for research and training purposes in Ile-Ife, Akanran, and Ogbomoso in Nigeria, and Tchaourou, Ouaké and Djidja in Benin.
- Training to NGO, Extension Agents, on the project innovations (micro dosing).
- Selection of master farmers
- Selection of demonstration farmers (definition of the contribution of producer, ONG, establishment of the convention of implementation)
- Capacity building of farmers (training)
- Extension experts created "demonstration satellite plots" where agronomic technologies were established
- Use of farmers field days to invite farmers groups and train them on the various agronomic, seed production and value addition technologies
- Setting up of e-platform SDA center in Nigeria to facilitate further transfer of technologies between researchers and vegetable producers
- Demonstration establishment (design demonstration protocol, setting up demonstration plots
- Monitoring (Exchange visit, data collect, data analysis, restitution)
- Selection and training of other actors on value addition innovations (processors, marketers, etc)
- Communication/diffusion of outputs (radio jingle, exchange visits, video, posters)
- Collection of quantitative data

3.4 Scaling model efficiency criteria

The scaling up approach implementation started at 12 months after project inception. The efficiency is then presented on 6 monthly basis starting from the 18 months. We considered the following criteria computed as an average at district level in Benin and Nigeria to enable us measure the efficiency of each scaling up model:

- Number of farmers reached and disaggregated according to gender
- Total land area under indigenous vegetables
- Total land area now under fertilizing microdosing

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We finally reflected some lessons learnt through the process of the implementation.

4.0 Results

Efficiency of the scaling up models

4.1.1. Total number of farmers reached by MicroVeg (March 2016-March, 2018)

In Benin, the number of farmers reached by IP increased from 855 (12 months) to 9,353 (36 months) whereas the number reached by SDA increased from 200 (12 months) to 1,766 (36 months) per district. SDA reached almost one fifth of the performance of the IP in Benin, with women participating by up to 46% .The results showed that IP reached farmers more than SDA. Hence, The Innovation Platforms performed better than the Satellite Dissemination Approach (Figs. 1 and 2). In total for IP and SDA enabled to reach 10,005 farmers (12 months) to 108,181 farmers (36 months).

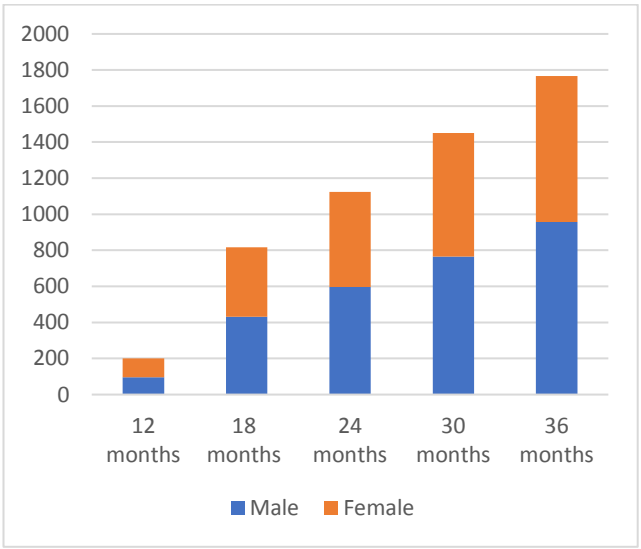


Fig 1: Number of farmers reached in SDA per district (Benin) (Benin)

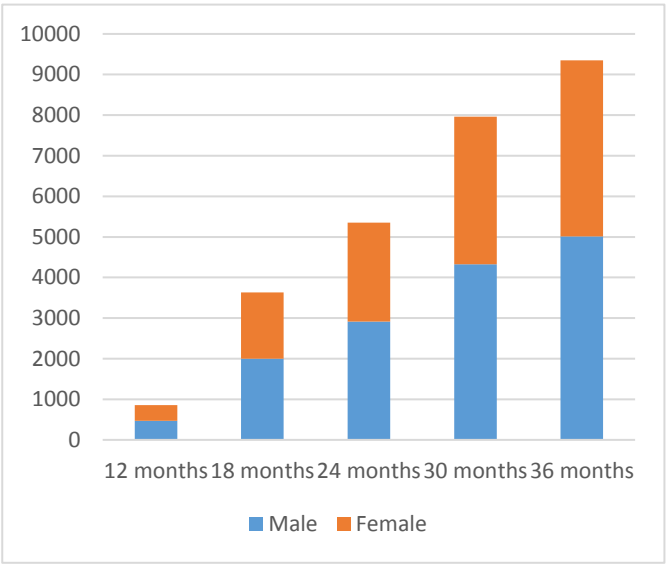


Fig 2.a: Number of farmers reached in IP per district

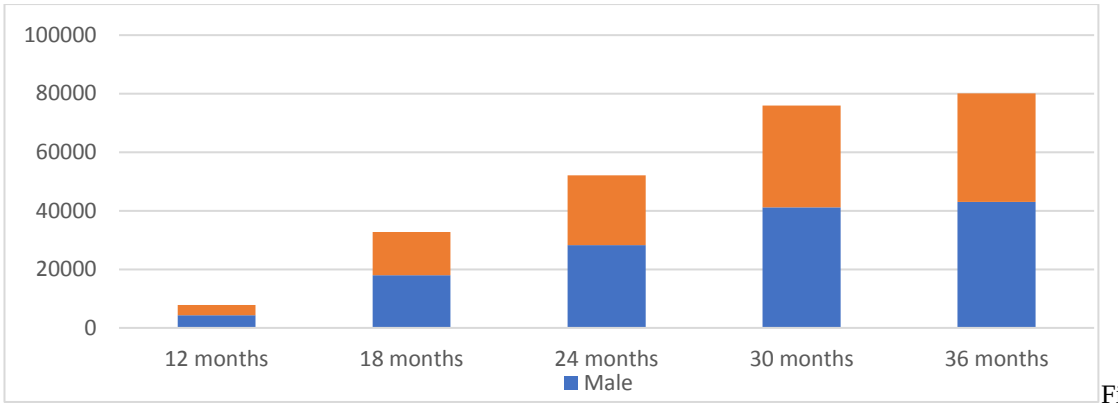


Fig2.b. Total Number of farmers reached in IP and SDA in Benin per district

Nigeria

In Nigeria however, the number of farmers reached by IP increased from 33,600 (12 months) to 226, 500 (36 months) whereas the number reached by SDA increased from 1,498 (12 months) to 65,615 (36 months). The average women share was 51.3% and male 48.7% with SDA performed one fourth of the performance of IP . IP significantly reached more farmers than SDA in Nigeria (Figs. 3 and 4)

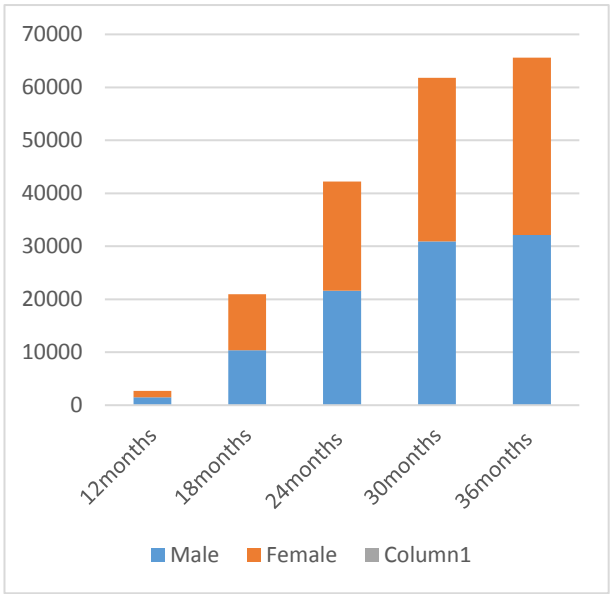


Fig 3. Total number of farmers reached by SDA in Nigeria

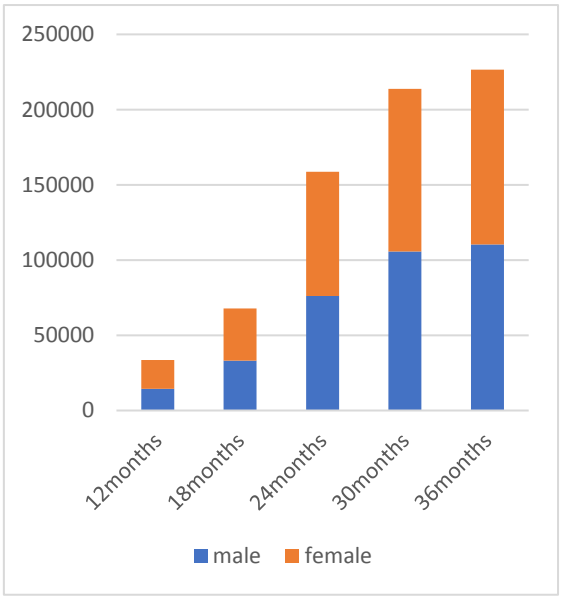


Fig 4. Total number of farmers reached by IP in Nigeria

As shown in Table 1, our project reached a total of 309,572 farmers (50.6% female) in 36 months. the total number of farmers (vegetable producers) reached in Nigeria is 229,750 (51.6% female) while in Benin, 80,122 farmers (46.3% female) were reached through both scaling up models, SDA and IP. This shows that the project has effectively reached target number of farmers planned for the project period.

Table 1: Number of farmers (producers) reached (As of March 2018)

Country	Total number of farmers	Male	Female	%Distribution
Nigeria	229,750	111,300	118,450	48.4%male, 51.6%female
Benin	108,181	58093	50,087	53.7%male;46.3% female
Total	337,931	169,393	168,537	49.5% male; 50.5% female

4.1.2. Actors reached by the two models

Within 36-months period, in Nigeria, majority of the actors at IPs are vegetables producers (229,750 with 51.5% female)(Table 2a) while in Benin (Table 2b), producers are 80,122 (46.3% female). This is followed by vegetable marketers (21,528 with 71.2% female) in Nigeria (Table 2a) while in Benin, vegetable marketers are 6,948 with 72.7% female (Table 2b). A total of 561 are processors (62.5% female) in Nigeria (Table 2a) while Benin (Table 2b) recorded 12,562 processors with 98% female. Also, 65 (21.5% female) of the actors in Benin (Table 2b) are extension workers/policy makers while in Nigeria (Table 2a), 945 (52.4% female) of the actors are extension workers/policy. In Benin, seed suppliers are 140 (32.1% female) while fertilizer suppliers are 188 (79.0% female). In Nigeria (Table 2a), seed suppliers are 478 (48.1% female) while fertilizer suppliers are 275 (43.6% female). Actor with the least number of female is the transporters with 1.3% female in Nigeria and 0% female in Benin (Table 2b). In all the IPs in both countries, there were 189,589 women (53.5%) and 164,657 men (46.5%).

Table2a: Breakdown of actors reached by the two models (Pooled data for March 2016 to March 2018 (Nigeria)

Actors	**18 months**		**24 months**		**30months**		**36 months**		**%**
Nigeria	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Gender**
Veg producers	33040	34680	76186	82530	105640	108200	111300	118450	49% male, 51% female
Processors	76	71	83	140	107	208	211	350	38% male, 62% female
Veg marketers	60	321	1175	2450	5832	10570	6200	15328	29% male, 71% female
Veg transporters	217	0	350	5	462	5	620	8	99% male, 1% female
Extension service /policy makers	125	86	280	187	425	480	450	495	48% male, 52% female
Seed supplier	64	55	120	101	244	227	258	210	55% male, 45% female
Fertilizer supplier	89	58	107	96	147	101	155	120	56% male, 44% female
Total	15031	19791	35155	37659	83403	94121	119194	134961	47% male,

									53% female

Table 2b: Breakdown of actors reached by the two models (Pooled data for March 2016-March 2018) (Benin)

Actors	**18 months**		**24 months**		**30 months**		**36 months**	
Gender	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Veg producers	18030	14679	28302	23842	41209	34792	42991	37131
Processors	45	2123	90	6369	180	8917	248	12314
Veg marketers	612	1059	918	2648	1468	3707	1896	5052
Veg transporters	10	0	13	0	18	0	66	0
Extension service	6	4	18	8	36	11	51	14
Seed supplier	25	11	38	13,2	79	26	106	34
Fertilizer supplier	37	50	48	60	82	72	105	83
Total	18765	17926	29427	32939	43072	47525	45463	54628

4.1.3 **Land area (ha) under vegetable production**

The data in Table 3a&b shows the average land area under vegetable production in Benin and Nigeria within two years of intensive Microveg project scaling up intervention. In Benin, the average land area devoted to vegetable cultivation increased from 985 ha to 2575 ha in the period of 12 to 36 months while in Nigeria, total land area increased from 9,105ha to 79,110ha within the same period. The average land area per farmer increased from 0.02ha to 0.07ha in Nigeria and from 0.03 to 0.06 ha in Benin, within the period of Microveg intervention. This is an indication that more farmers devoted their land resources to vegetable production during the period of MicroVeg intervention while yielding a significant increase in land area by 250% used for vegetable production

Table 3a: Effect of Scaling up Approaches on average land area (ha) under vegetable production (Benin)

	Land area (ha) September 2016, 18 months	Land area (ha) March 2017 24 months	Land area (ha) September, 30 months	Land area (ha) March, 2018 36 months
IP land area (ha)	795	1155	1990	2025
SDA land area (ha)	190	290	450	550
Total (ha)	985	1445	2440	2575

Table 3b: Land area (ha) under vegetable production between March, 2016 and March, 2018

Location	Total number of farmers (March 2016)	Land area (ha) September 2016, 18 months	Land area (ha) March 2017 At 24 months	Land area (ha) September, 2017 at 30 months	Land area (ha) March, 2018 at 36 months
Oyo State	94625	1020	3320	3675	6623,75

Ogun State	126510	1045	2905	4595	8855,7
Osun State	105060	1175	3860	3900	7354,2
Lagos State	289500	2320	4080	11400	20265
Kwara State	226150	1445	2210	8100	15830,5
Ondo State	141625	1060	2960	5335	9913,75
Ekiti State	146700	1040	2890	5250	10269
Total (ha)	1,130,170	9,105	22,175	42,255	79,110

4.1.4 Average land area under micro dose application

The average land devoted to microdosing on IVs in IP districts was more than eight times that of SDA (Figs 5 and 6). The average land under microdose application increased from 11ha/district (18months) with IP to 280.47ha/district (36months) compared to 4-33.26ha/district with SDA (Fig 2). The microdosing technology is adopted on 70% in the IP approach against 30% in the SDA approach. Women adopted more (three times) microdosing than men in IP districts in both countries

As shown in the Figure 6, as at 18 months into the project, some farmers in Nigeria had commenced practising fertilizer microdosing with 23 ha and 9 ha under the technology at IP and SDA locations respectively. Women farmers already commenced the use of the technology as at 18 months into the project, whereas in Benin, women commenced using the technology at about 24 months (Fig 5). The explanation for this is that NiCanVeg put Nigeria ahead in vegetable production technology compared to Benin. Generally, the average land devoted to microdosing in IP districts was about three times more than that of the SDA. The average land under microdose increased from 11ha/district (18 months) with IP to 280.47 ha/district (36 months) compared to 4 – 33.26 ha/district in SDA in Benin while in Nigeria, average land under microdose increased from 23ha/district (18 months) to 3560ha/district (36 months) under the IP compared to 9-45 ha/district in SDA from 18 months to 36 months. Women adopted more (three times) microdosing than men in IP districts. This is also an indication that IP performed better than SDA in the districts.

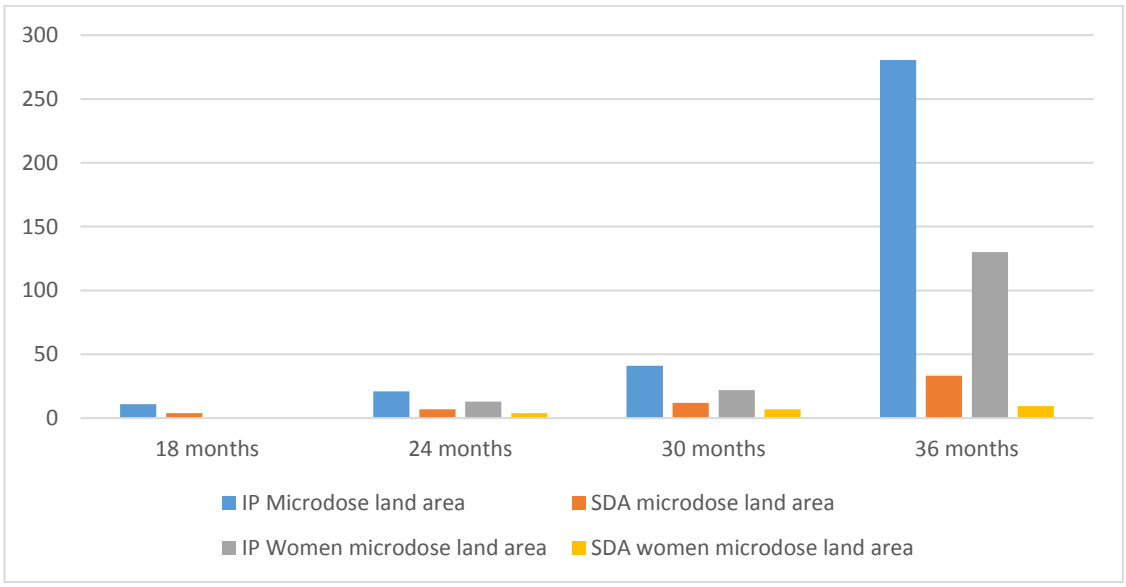


Fig 5: Effect of scaling up approaches on the average land area (ha) under microdose application (Bénin)

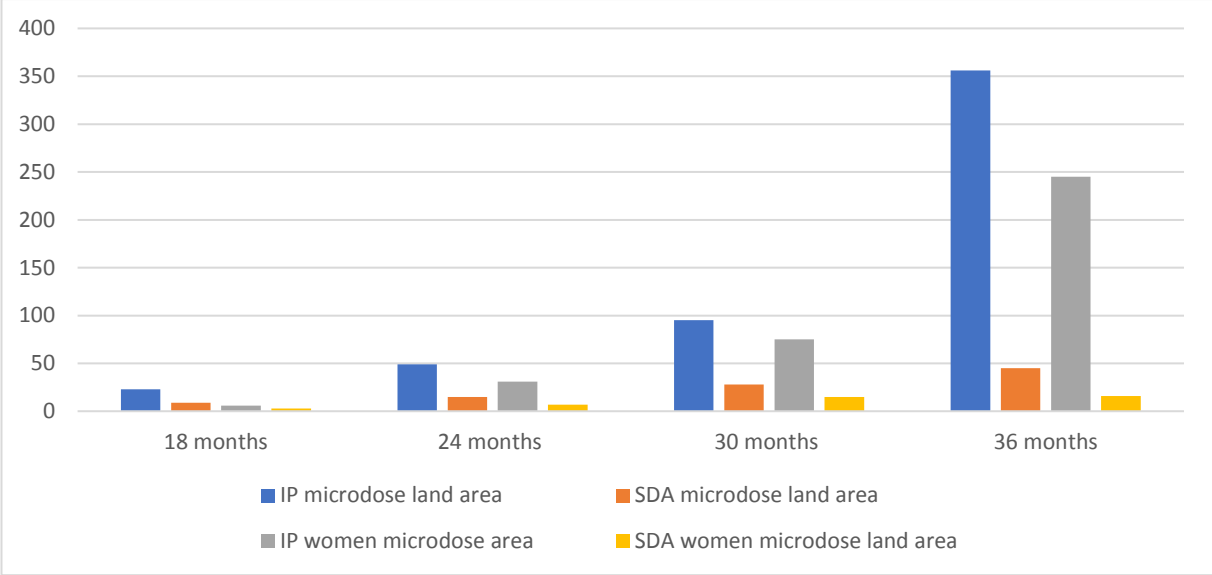


Fig 6: Effect of scaling up approaches on the average land area (ha) under microdose application (Nigeria)

4.1.5 YVSC SDA scaling up activities

As shown in Table 7 below, as at March 2018, MicroVeg technologies in Nigeria still remained in 124 schools in all states as stated in the last report (5th technical report). We trained 881 teachers (46% female) but now the project has reached an additional 22% increase in students from 68,000 students (45% female) to 82,713 students (51% female) while in Benin, 57 schools have been reached training 76 teachers (38% female) and reaching 30157students 41% female). The total revenue generated by the YVSC in Benin and Nigeria were USD2197 and USD2428, respectively.

Table 4: YVSC SDA scaling up Distribution in Nigeria and Benin

Location	Number of schools	YVSC members		Total students	No of teachers trained		Total teachers trained	Income from vegetables	USD
		Male	Female		Men	Women			
Nigeria	124	40212	42501	82713	474	407	881	N850,600	$2428

Benin	57	17643	12514	30157	47	29	76	1221 000 CFA	$2197
Total	181	54986	43325	98311	521	436	957		$4625

4.1.6 Challenges raised at IP level affecting vegetable production and marketing

Table 5: Issues of concern raised by actors at IP level and action taken by MicroVeg

Issues	**Initial action plan of approach strategy**		Action taken by MicroVeg
	IP	SDA	
Basic inputs for dry season farming	None, except requested by actors	Provided by project for demonstrators/ direct beneficiaries.	Based on needs assessment, MicroVeg supplied irrigation pumps and accessories to farmers groups. We supplied watering cans and knapsack sprayers to some other groups, both for IP and SDA.
Transportation	None	None	Involved transport unions at the IP cells, SDA locals training. Linking the transport companies with farmers, drastically reduced transportation problems with IP.
Access to high quality Seeds	None, except requested by actors	Provided by project for demonstrators/ direct beneficiaries.	We supplied free seeds and train farmers (SDA and IP on demand), on how to handle the seeds..
Access to loans	None	None	We facilitated a special memorandum of understanding (MoU) with financial institutions in IPs. Efforts to make loans accessible to all stakeholders has not yet yielded the desired result. Due to criteria set by financial institutions for granting loans. Although in SDA, farmers also requested loans, we found that financial institutions were more favourable to support IP farmers.

Diseases and pests	None	Training included short modules on pest management of TLVs;	Trainings on pests and diseases control are organized with producer representatives in SDA as planned. But IP farmers in most cases also requested this training and beneficiated. This has enhanced knowledge sharing and dissemination. We taught farmers botanical pest control using neem leaves extract, cost effective, not poisonous and simple to use.
Access to fertilizer	None, except requested by actors	Provided by project for demonstrators/ direct beneficiaries.	Supplied fertilizers in minimum quantity to farmers as incentive in SDAs and IPs on demand. We have also linked farmers to fertilizer markets in IPs.
Women access to land	None	None	Include land owners in our IP cells. This effort is yielding results. There is now an improvement in women access to land through our intervention. In SDA, direct beneficiaries/ demonstrators were selected base on land ownership criteria.
Lack of fresh veg market	Integration in IP	None	With IPs, we have connected farmers mainly women to marketers and processors. We engaged new type of entrepreneurs with innovative processing (packed boiled and freezed vegetables). We are opening new market opportunities through the innovative vegetables-based food developed by the project (bread, petits cailloux/chichin enriched with veg, vegetable based sirop and juices, etc). In SDA, no direct support was provided by the project although new entrepreneurs (value addition, marketers, of IPs districts expanded to SDA districts.

To ensure linkage with national policies and scaling-up from the local to the national level, mechanisms need to be put in place to engage policy makers at different levels.

Table 6: Issues of concerns in successful vegetable business as it affects gender

Issues	**Male**	**Female**	**Male**	**Female**
Period	**As at Sept 2016 (18months)**		**As at March 2018**	
Transportation	30%	70%	40%	60%
Marketing	10%	90%	50%	50%
Access to quality seeds	40%	60%	50%	50%
Access to loan	30%	70%	50%	50%
Diseases and pests	30%	70%	50%	50%
Access to fertilizer	30%	70%	40%	60%
Access to inputs	25%	75%	40%	60%

At IPs, the 7 issues in the Table 6 have been the major problems affecting both gender. As at September, 2016, among the chosen communities we worked with, over 75% of women were affected by these issues more than men. As we worked over the months, we consciously spearheaded activities that permitted women to have equal opportunities as the men had. For example, while setting up IPs, we ensured equal representation of men and women. for access to loans, we had both men and women have equal access by ensuring that the conditions were favorable to the women making sure that restrictions such as collateral were not considered for applying for loans, this was important as culturally, women were not eligible to own land unless they purchased it with their money unlike men who had sole inheritance of land from the family setting. For issues like access to inputs such as fertilizer, as at the time, of the project end, women access had improved greatly due to access to funds to buy fertilizer through loans however still at growth stages at our chosen sites as the women are gradually adopting our models and women's access was rated at 40% The scaling up activities have therefore been designed to support more female gender and ensure that women had better access to facilities, knowledge and support.

Distribution strategy to address IP issue of access to inputs

Table 7.1 shows that 6,625kg of Ugu (*Telfaria occidentalis*), 1085kg of *Solanum macrocarpon*, 2200kg of *Amaranthus* was distributed to different farmers groups to reduce the challenge of low access to seeds to the farmers. In Benin, 1,910 kg of Tchayo (*Ocimum gratissimum*), 1,590 kg of *Solanum macrocarpon*, 1,848 kg of *Amaranthus* was distributed to different farmers groups. Additionally table 8.1 shows other incentives that were distributed to effectively support farmers in combating some of the issues highlighted at the IP which they were experiencing in their vegetable business. In Nigeria, 200 knapsack sprayers, 120 pumping machines, 120 irrigation hoses, 10 fuel generators, 5 deep wells established, 500 bags of urea fertilizers and 1000 sachets of seed dressing treatment were distributed to spread all over the chosen sites. Our distribution strategy ensured that every group received one support or another to boost their production. In Benin, 126 knapsack sprayers, 29 pumping machines, 29 irrigation hoses, 5 shallow wells established, 210 bags of urea fertilizers, 420 watering cans and cutlasses, and 30 IVs Sale Counter Kit (Kit Comptoire de Vente) were distributed.

Table 7.1: Seeds distribution to farmers in Nigeria

Seeds	States	**Quantity distributed (kg)**
Ugu	Osun Oyo	700 1300

	Ondo Ekiti Lagos Kwara Ogun	830 500 2045 600 650
		6,625 kg
Igbagba	Osun Oyo Ondo Ekiti Lagos Kwara Ogun	140 160 124 120 250 140 150
		1084 kg
Efo tete	Osun Oyo Ondo Ekiti Lagos Kwara Ogun	245 220 210 215 655 130 545
		2200 kg

Table 7.2: Seeds distribution to farmers in Benin

Location	Tchayo (Kg)	Tete (Kg)	Gboma (Igbagba) (Kg)
Parakou	142	140	125
N'Dali - Bembérékè	151	121	133
Djougou	139	140	101
Boukoumbé - Natitingou	139	130	117
Bohicon	132	121	117
Abomey Calavi	264	217	208
Sèmè	92	86	66
Cotonou	248	272	195
Grand-Popo	150	250	200
Tchaourou	139	130	117
Ouaké	164	121	117
Djidja	151	121	94
Total	**1,910**	**1,848**	**1,590**




Table 8: Total incentives distributed to farmers groups

	Nigeria		Benin
Items	Number of items	Number of groups	Number of items
Knapsack Sprayer	200	20	126
Pumping Machine	120	75	29
Irrigation hoses	120	75	29
Fuel generator	10	10	-
Shallow/Deep wells	5	5	5
Urea fertilizer	500	150	210
Seed treatment	1000	100	
Watering cans			420
Cutlasses/hoes			420
Kit Comptoirs de Vente de LFTs			30

.Access to financial resources:

- In Nigeria, to ensure unhindered credit sourcing for vegetables value chain actors, our project initiated and signed MoU with LAPO Microfinance Bank (MfB). MicroVeg negotiated the interest rate on the loans and the repayment period with the LAPO MfB. Loans are to be repaid between 6-12months at an interest rates of 3.6% monthly (other bank loans in Nigeria attract at least 19% interest rate) with repayment to commence at the end of 60 days after release of funds

and an incentive of a 40% draw back on interest for farmers who complete loan repayment by the end of the loan duration.

- Nigeria MicroVeg facilitated the negotiations with LAPO MfB with farmers in attendance and today we are pleased to report that as at March, 2018, LAPO MfB has provided a total loan of NGN13 million (US$37,142=CAD47,514) for vegetable production to our farmers.

4.1.5 Other Innovation Application

Innovation Platform allowed better dissemination of the different business models initiated by the project. More than 70% of the farmers participating on the IPs learned how to search and establish links for the sale of their produce.

4.2 Contribution of NGO's

Our project utilized the expertise of 5 NGOs to achieve our scaling up objectives (The Green Generation, The IAR&T, Alpha Omega Environnement AOE, Association pour la Recherche et la Promotion en Pisciculture Intégrée AR2PI and ZACOZA-ONG). Since inception in March, 2015 until March, 2018, all NGO's recruited under this project worked tirelessly with 5 major goals among other numerous roles which were played by all the teams.

- Reaching planned farmers targets within chosen locations
- Scaling up all technologies offered through the research team using the SDA and IP approaches
- Ensuring a sustainable, mutually engaging relationship between all actors within the vegetable value chain
- Working with the research team to ensure fair incentive distribution to all actors especially needy producers
- Providing accurate feedback information from field implementation, innovation platforms, farmers training, and adoption dynamics to the research team.

This team was led by the Directors of each of the 5 NGOs were exceptional at delivering on their roles and were hugely responsible for the success recorded in scaling up of the agronomic and food processing technologies

Policy Actions

In order to ensure the goal of influencing policy direction to include the vegetable value chain as a key income crop and into the agricultural agenda, the project engaged the government represented by officials, staff and even the governor of one of the chosen locations. The Table 9 below shows how the government got involved in the project and resulting actions as a result of their intervention

Activity	Government involvement	Resulting Outcomes

Inception workshop	Attendance by Representatives of Osun state government World Bank Country Director representative	Awareness creation of importance and relevance of the vegetable value chain to economic development in Nigeria and Benin
Launching of Innovation platforms	Attendance by Representatives of Permanent secretaries. Government Extension Directors and staff	Full support from Government Participants on the approach of dissemination and buy-in to join the implementation team to reach actors in chosen locations
Young Vegetable Scientists Club Approval	Bureaucratic procedure to analyse YVSC based on credibility and objective of MicroVeg and provide signed approvals through state offices for scaling up in schools	Government demonstration of understanding of the full impact of vegetable innovations outcome for students' education.
Intervening Youth Empowerment program	Governors of Osun and Kwara states in Nigeria established youth-led ventures (>10,000 young people) for vegetable production all year round. In Osun, the project was called OYES Agric brigade while in Kwara state of Nigeria, it was called Go-Kwara.	Provided source of income to >10,000 unemployed young people. Established the potential of the economic power of the vegetable value chain to the government. Both projects are now both institutionalised in both states.
Capacity Building for Vulnerable people	Pilot vegetable demonstration site set up in a maximum security prison, Ilesha, Osun state, Nigeria was established with full government support.	A model to be replicated in prisons all over south-western Nigeria for its skills acquisition transfer, provision of low cost healthy dietary options for inmates and income generating ventures for prisons all year round.
Seed production training	Training of government districts extension officers	Ensured capacity building of extension officers for continuous transfer of MicroVeg technologies even after the termination of the project
Value Addition training	Training of government State extension officers	Ensured capacity building of extension officers for continuous transfer of MicroVeg technologies even after the termination of the project

These actions greatly supported positive acceptance of vegetables as an important crop in all chosen states of the project, led to institutionalization as a youth economic empowerment tool and positive

livelihood development in areas of nutrition, education and entrepreneurship. The project was able to initiate vital engagements and take necessary actions on policy direction. To fully grasp the intensity and full policy change for vegetables as a crop in Nigeria, it would need at least 5 more years of more engagement which the termination of this project phase does not allow.

5.0. Lessons learnt

5.1. Innovation platforms drives more women to adopt innovations

There is no difference between men and women in the diffusion of innovations by innovation platform. But scaling up of leafy vegetables innovations is more rapidly happening with men than women through the Satellite Dissemination Approach. The Innovation Platform approach helps to reach the target group, both male and female, more rapidly than Satellite Dissemination Approach. Micro dosing fertilizer adoption was higher with women in IP than in SDA.

5.2 Partnership drives more actors than capacity building

The partnership between actors yielded better dissemination of innovations than to strengthening their capacity. In addition, capacity building increases the diffusion of innovation among men more than women. Field visits enhance a partnership between the actors involved in the demonstration.

5.3 Incentives are a necessity for the success of innovation platforms

In order to have the best participation of the stakeholders in the Innovation Platform, it is necessary that a clear and tangible motivation/incentives exists, market for sale of vegetables, specific training opportunity to expand the capacity of the actors and donation of small equipment.

5.4 A mix approach may be the better option of scaling up

Linking technologies to the value chain is essential to ensure successful adoption. Various actors, including producers, researchers, extension workers, local policy makers and the private sector, need networks to improve their knowledge, which will be transformed into actions and benefits.
For an efficient scaling up of innovations it is necessary to put in place a system that uses Innovations platforms and Satellites Disseminations Approaches as complementary approaches and not exclusive approaches. For instance, to guarantee an efficiency of Innovation Platform, there is a need to demonstrate the benefits of technology through on-farm demonstration and other approaches to convince producers and other stakeholders, a strategy normally devoted to the Satellite Dissemination Approach. Several concerns were raised by actors during the implementation of both approaches and the project had to take the appropriate actions (Table 6).

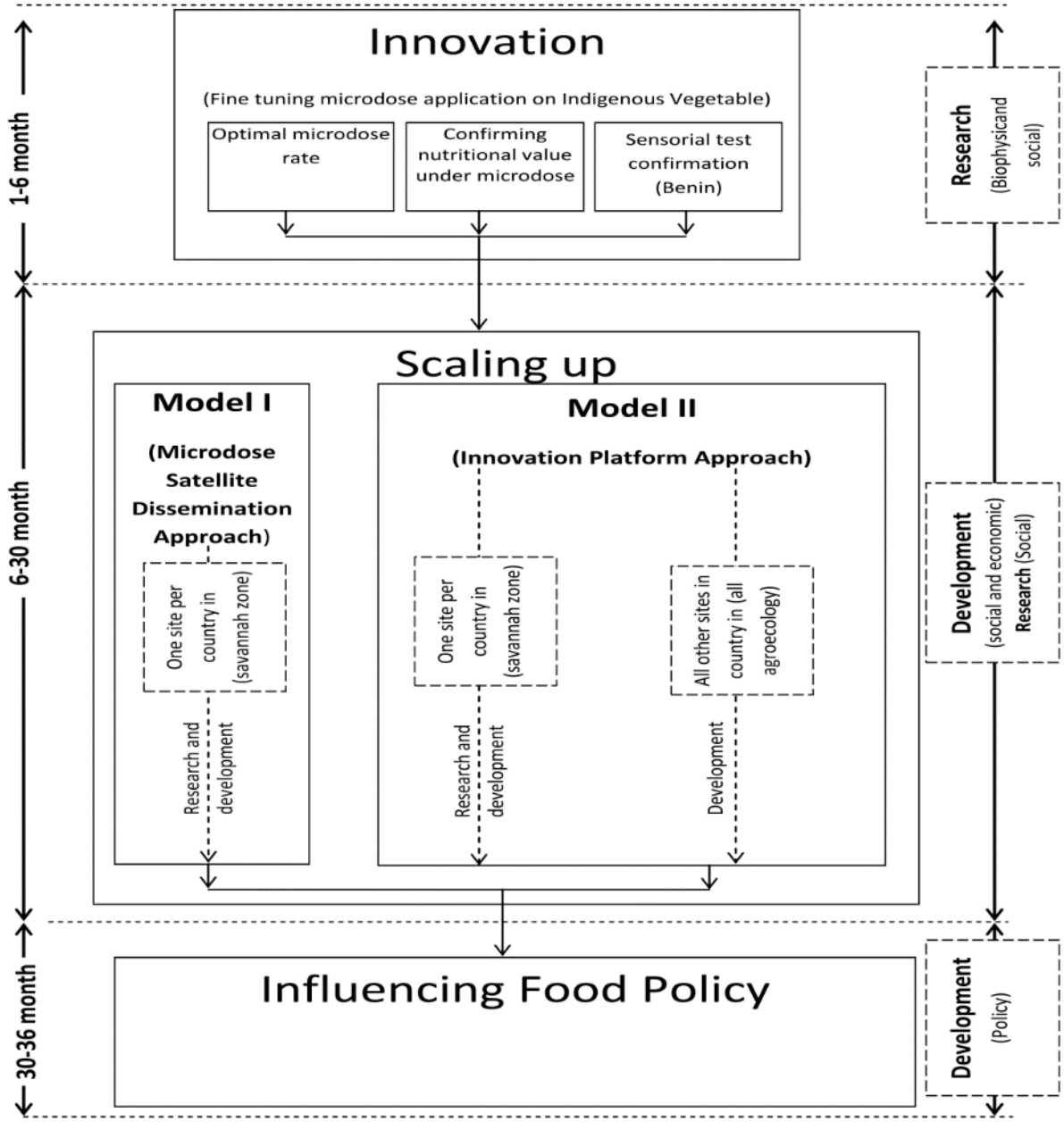
5.5 **Issues related to access and control over resources are better addressed on IPs:** Involvement of many actors along the vegetables value chain, through the Innovation Platform (IP) enables MicroVeg to understand issues of concerns in the entire value chain. The issues of concern include lack of facility for dry season farming, lack of high quality seeds, poor access to land, lack of organized transportation, pests and diseases problems, poor fertilizer supply. In response to those constraints, MicroVeg project provided the necessary intervention to address the concerns of the different actors. A comparative analysis (2015 -2018 of the level of concerns between male and female farmers showed that with MicroVeg's IP intervention, the gap between men and women farmers is closing up. As a result of the success experienced on IP women and men now have equal access to transportation, high quality seeds, pest and disease control, fertilizer and loans. This shows that IP helped to address gender inequality and issues related to access and control over resources.

5.6 **Issues of access to funds are better addressed on IP and sustained**: the approach at the IP: due to the presence of multiple actors, it was easier to negotiate and gain favourable conditions for the farmers. the banks were more comfortable working with these diverse group over a single actor group, their feedback was that they could sense more commitment and business environment than when working with single actor groups like the SDA. In March 2017, the farmers had accessed 5 million naira for a tenure of one year which the farmers fully repaid by 8 months. This encouraged LAPO Mfb to release an additional 8 million naira to the farmers reaching 220 actors on the IP in January, 2018 without even informing MicroVeg. This proves that the IP can sustain initiatives set up for progress of actors

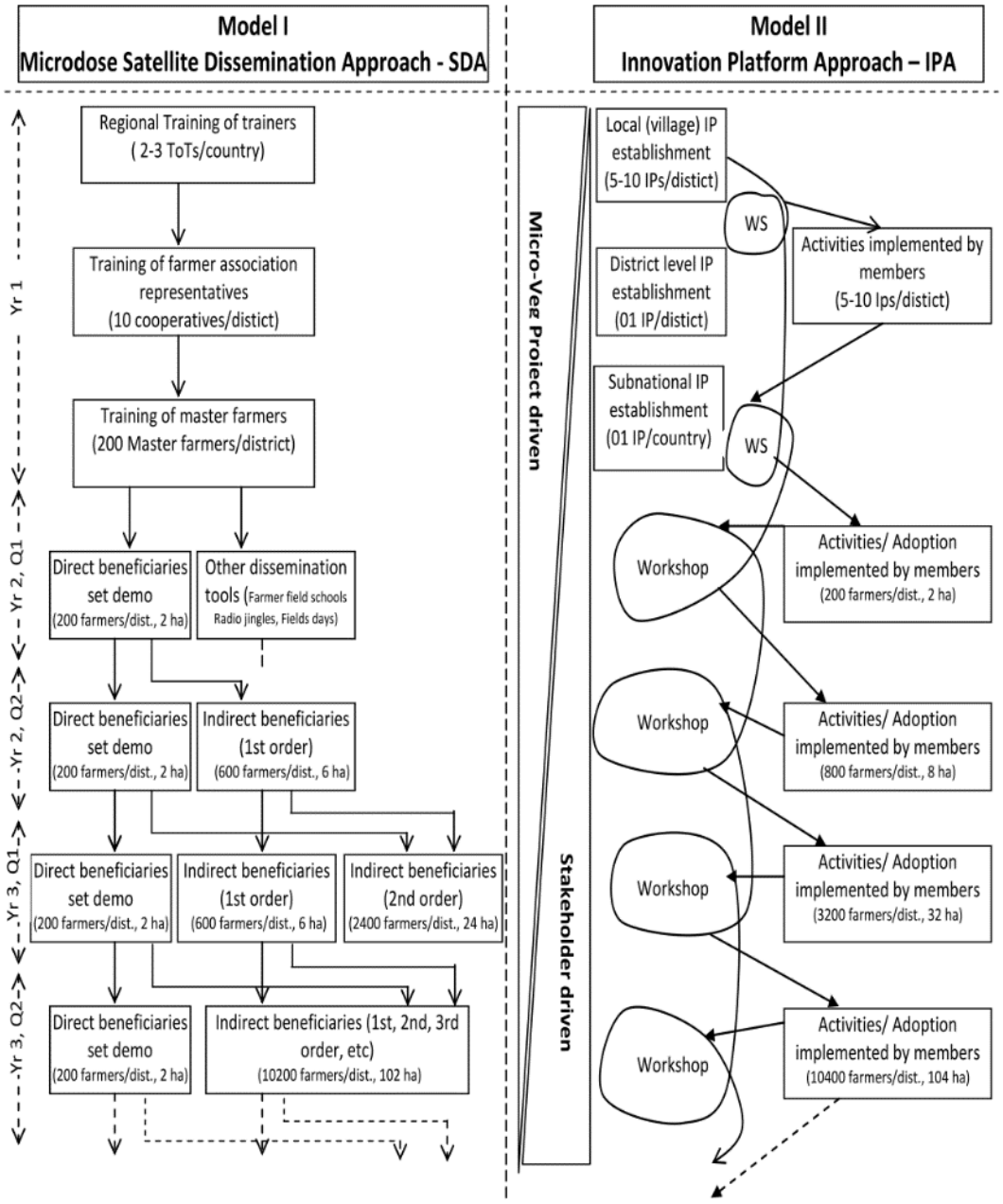
6.0 Conclusion

The Innovation Platform allowed us to reach a large number of vegetable producers and other stakeholders/actors in the vegetable value chain than SDA. Innovation application is better with the IP approach than the SDA. The Innovation Platform approach is therefore technically more efficient than the SDA.

Appendices



Framework of the MicroVeg project scaling up strategy



Comparison of the scaling up models implementation